AN INITIAL APPROACH USING AUDIENCE RESPONSE SYSTEMS AS A STRATEGY FOR IMPROVING THE LEARNING PROCESS

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Abstract

The current downturn in the Spanish construction sector has indirectly and negatively affected motivation levels of Technical Architecture Degree students. This has resulted in a reluctance among students to study technical degrees in this sector. Faced with this predicament, the question arises as to the relevance of the traditional model of university teaching.

Traditionally, the process of teaching and learning in subjects related to building systems has been carried out following a theoretical and practical framework. This teaching methodology is based on a traditional learning model, with theoretical and practical classes, where tasks related to the theoretical contents are solved.

A new methodology based on dynamic strategies, promoting discussion, reflection, teamwork, and collaborative decision-making is proposed. Professors were asked what and how they want their students to learn, and considering the generally positive student attitudes towards the use of new technologies, they were implemented in the new learning method. The goal is to recover lost motivation, encourage self-learning as well as a collaborative and multidisciplinary approach using new technologies, and last but not least, break the participation barrier that normally exists in lectures which typically deal with completely new subjects.

Completing an individual post-lecture test followed by a class debate on the results enables each student to build a sense of self-confidence in the knowledge area. The tests include questions that simulate everyday scenarios, such as the management of a building. This encourages a highly dynamic and interactive lecture, which in turn stimulates confidence and motivation. Each student accesses the test via the Socrative mobile application where short tests become available at the end of each lecture.

This paper presents a new methodology based on active learning using the Audience Responce Systems (ARS), in several modules of the Architectural Technology Degree.

Keywords: Audience Response Systems, Socrative method, architecture, smartphone, gamification, learning, motivation.

1 INTRODUCTION

1.1 Improve the teaching-learning process by increasing student participation

The following paper presents a new learning methodology applied to a module in the third-year of the Architectural Technology Degree at the University of Alicante. The application of new technologies in the classroom results in more dynamic activities that improve team work and encourage greater student participation.

Currently, the teaching of this subject is based on a traditional learning model. There are sixty hours of face-to-face classes that follow a theoretical-practical model with conventional evaluation tests and student performance is not very satisfactory. Moreover, there is a lack of communication between teachers and students.

Students are generally insecure of their knowledge and therefore are reluctant to participate in practical sessions. They do not attain the minimum levels of knowledge required to deal with a construction problem.

In general, the theoretical knowledge acquired is insufficient and students have serious difficulties in reading comprehension and therefore they are not able to understand all the information they receive. As a result, the 90 hours allocated to study time at home are not used. Given this situation, the

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teacher must consider a new teaching strategy to regain student motivation and commitment to learning.

Teaching methods need to be changed and motivation must exist from the teaching profession to implement the necessary changes. It is necessary to create a better learning environment, and as a result, the student will participate and finally will understand the module's contents.

Students have a positive attitude towards the use of new technologies. Taking advantage of this situation, we will strengthen the implementation of dynamic strategies that encourage debate, reflection, teamwork, collaboration and decision-making.

It is evident that the theoretical and practical contents of the module are related to those learned in other similar subjects that have a more global vision of the problems of the construction sector.

1.2 Literature review

The traditional model of higher education that involves the scheme of lectures to a passive audience is increasingly recognized as inefficient [1] [2]. Gamification is becoming widely used in various sectors, such as technology, communication, psychology, education and health, among others.

Gamification consists of a strategy to motivate groups of people [1] through the use of game tools in non-ludic environments, in order to enhance motivation, concentration, effort, loyalty and other positive values common to all games.

This learning methodology motivates students to improve their academic performance and consequently their results. Dynamic classes are more attractive to students and therefore, they are able to achieve their desired goals and, consequently, effective learning takes place.

In addition, there is an atmosphere of dialogue that provides individual and collective development. Several hypotheses are solved based on different situations provided by gamification [3]. Many teachers have studied and applied new didactic and methodological approaches to the teaching of diverse disciplines [4] and devised a multidisciplinary method of dealing with problems relating to student learning and motivation [5] [6].

According to a study carried out by the *Fundación Telefónica* about the *Information Society in Spain 2015* [7], the smartphone is gaining ground among Internet users, surpassing the use of the computer as an Internet access device. This popularity of the smartphone is the result of an increasing number of easily downloadable mobile applications. Smartphones are used every day by 88.2% of Internet users. This percentage is expected to increase from the use of wearables.

1.3 Purpose

The main objective is to find a balance between learning in the classroom (face-to-face) and at home (non face-to-face) for the student and the teacher. It is a challenge to eliminate the traditional system of teaching established in this module, to give way to a new one, in which, it can be measured if the student actually devotes six hours of study per week during the semester. For the student this would be a new concept of work by being alone in his continuous learning but being supervised and guided by the teacher.

The content of this paper makes possible the use of teaching methodologies based on the use of mobile devices in the face-to -face theoretical and practical classes. It is necessary to look for a tool that allows students to interact with themselves and the teacher by adopting a new approach that is established in Fig. 1.

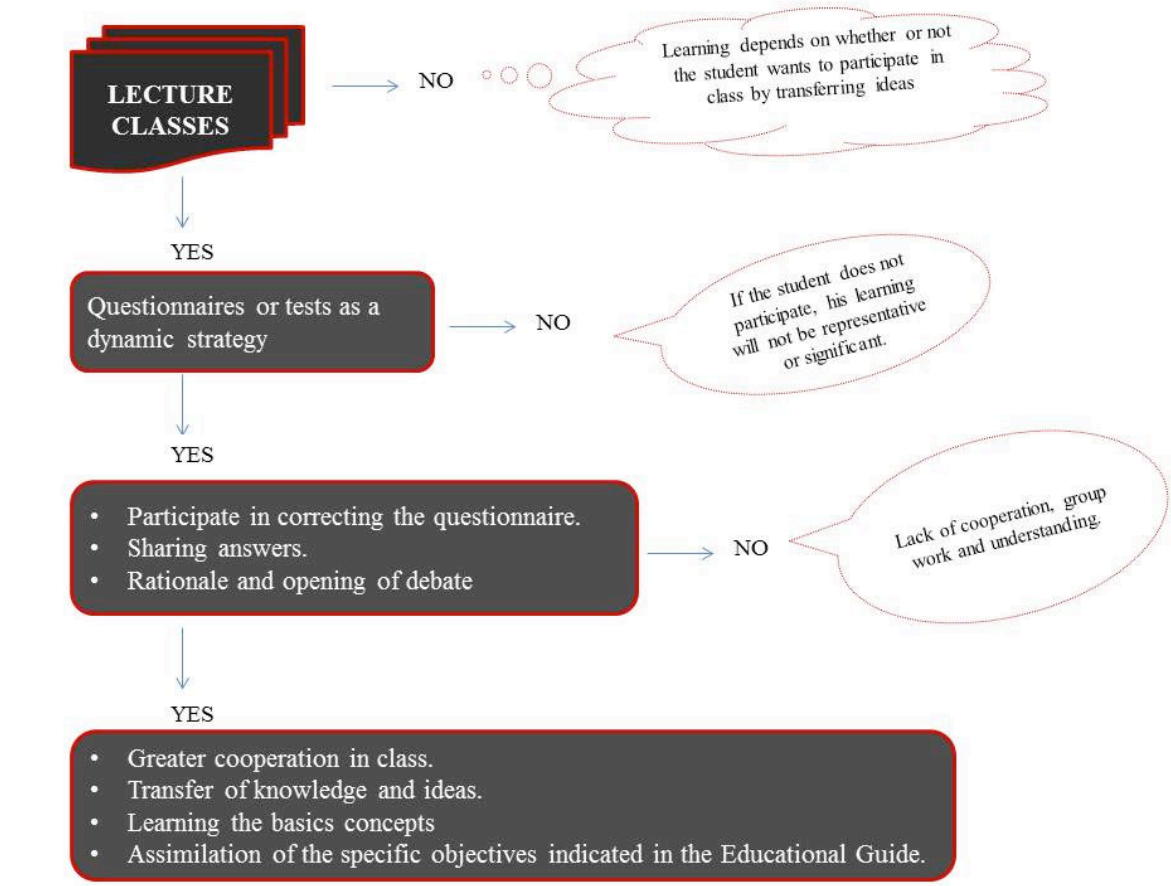

Fig. 1. New strategy for the lecture classes.

Another aspect to take into account to create a new model of more interactive teaching, are the observations made by external tutors of companies where students execute their internships as part of their degree programme. In the Internship evaluation document, the tutor assesses the student's work which involves a report on the responsibility, initiative, teamwork, oral and written communication competences. These areas requiring improvement, although in general the internship evaluations are good.

2 METHODOLOGY

2.1 Objectives

The main objective of this study is to achieve a greater collaboration between students, with the implementation in the teaching-learning process, by the use of a dynamic tool that made the teacher and the student are actively involved in the classroom. This dynamic tool must simulate everyday scenarios, in relation to the contents of the module.

In this way the students become aware of frequent problems, such as: insecurity, poor knowledge of construction processes as well as the machinery used in their realization [8].

It is intended to dynamically provide theoretical-practical sessions by the use of this tool, allowing the student to interact with the teaching staff and with their own classmates.

This implies a second objective, based on the design of a new teaching model - more active than the current one - which allows the ideas transfer and the retention of concepts with the consequent acquisition of the competences established in the teaching guide. The ability to synthesize, logical and critical reasoning and making decisions are acquired [9].

This new model must be able to arouse interest in the subject and the teacher has to loose his protagonism in favour of the student. The teacher must be able to orientate, cooperate and assist the student during the learning phase.

2.2 Research method and process

Firstly, being part of the continuous assessment, students have been involved in the course of *Computer and Informational skills CI2-Intermediate Level*, taught by the University Library of Alicante (BUA).

These same students have already realized the *Basic Level of the course CI2*. They acquired basic knowledge to be developed in the *Society of the Knowledge* and to be able to use the Information and Communication Technologies (ICT) properly.

This is an important starting point. The student learns where to find valid information for his knowledge and he learns to evaluate if it is useful or not for his works, workshops or even as a support material to complete his theoretical knowledge of every subject.

The last results of the *Intermediate Level CI2 Course* are very satisfactory, Fig. 2 and Fig. 3:

Construction Equipment, Installation and Auxiliary Resources Group 1 y 2	
Total enrolled	77
Number of groups	2
APT	58
NO APT	8
NOT PRESENTED	11

Fig. 2. Computer and Informational skills CI2-Intermediate Level. Results. Academic year 2015-2016.

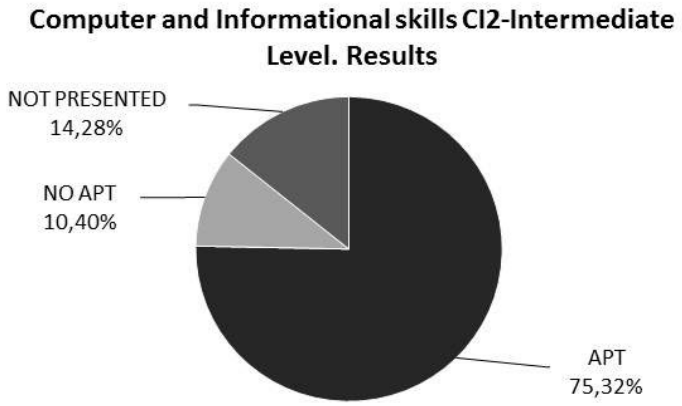

Fig. 3. Percentage of students apt, no apt and not presented with respect to the total number of students.

Despite this, 14% of the students do not take the course, either because they consider that the assessment of the course within the total qualification of the module is low, being 0.5 points out of 10 or, because the Educational Guide is not consulted appropriately or, they trust that the teacher will continually inform them.

It is the first edition of the *Intermediate Level CI2 Course* therefore there are no results before. The students who have passed it, do it with good grades, obtaining an average of 7.40 points out of 10 points, as can be seen in Fig. 4.

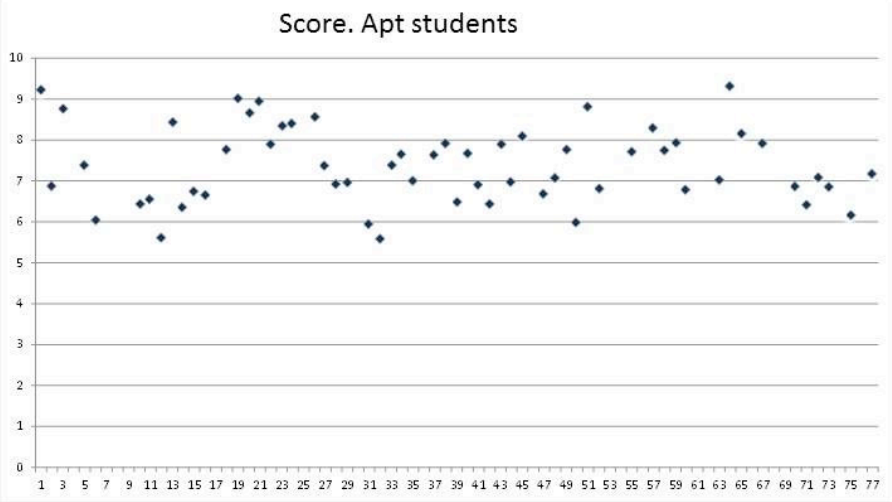

Fig. 4. Score. Apt students.

This course teaches how ICT works, what it does and how it can be used. To put ICT into practice, workshops are organized, which are part of the practical part of the subject. Thus, the student participates in the classroom, discussing and explaining his work, getting the feedback between the students themselves and between them and the teacher [10].

Students must present their knowledge on a specific topic of the syllabus. The teacher provides some guidelines and templates with the minimum knowledge to develop during the execution, exhibition and discussion of the work done in the workshops.

The student learns to summarize the information in a poster. This poster can be elaborated with the software the student considers.

The posters must be explained in public to the rest of the classmates and the posters have punctuation in the continuous evaluation of the semester, Fig. 5.

At the end of the explanation of every poster, a questionnaire is provided to evaluate each one. The students think the exhibition and the following debate on specific items, has helped them to understand better the theme developed in the lecture classes, responding to the doubts they had and they did not ask in the theoretical classes.

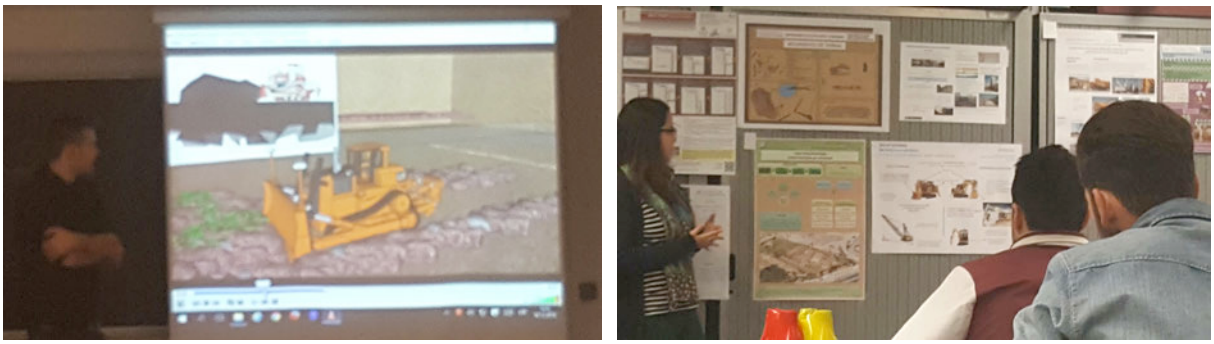

Fig 5. Poster exhibitions. Workshops.

At the same time as these workshops are made, it is necessary to search and choose dynamic strategies that put into practice the knowledge that the student is acquiring at the theoretical part of the subject.

With simulated images in 3D, Fig.6, and videos recorded in situ, students complement their learning. They are able to visualize, identify and explain construction processes, construction equipment, temporary installations and auxiliaries needed involved in a building construction.

The next step is to propose simulations of different construction systems buildings and debating the best justified solution.

In three or four people groups, the students answer theoretical questions of real situations during the construction of buildings. The necessary resources are identified according to the different phases of building, the coordination between different jobs, the construction equipment, installations and auxiliary resources are identified, Fig. 7.

Fig.6. Simulated 3D image. Superficial foundation and aerial view of a construction building. Emplacement of equipment, installation and auxiliary resources.

Fig.7. Questionnaire model for searching basic theoretical concepts.

With this methodology the student minimizes his insecurity and poor vocabulary about constructive processes or resources to carry out a building process. The student is always interacting with his classmates and the teacher which it was one of the goals set [11].

At the end of each theoretical topics, and after put into practice the learning that the student is acquiring, it is time to reflect what they have learned. Errors are not taken into account. Errors can be used to improve learning, decrease knowledge inequalities between them and feel less fearful of participating and giving their opinion on the subject that is being dealt with.

It is necessary to motivate the student to learn how to act when he developed his professional life. In order to carry out this phase, a pilot experience has been realized based on tools of Audience Response Systems (ARS), concretely with Socrative.com app.

3 RESULTS

3.1 A new methodology based on Audience Response Systems. A pilot experience with socrative.com

Currently there is a wide variety of ARS that facilitate the collection of student responses by the teacher in real time [12]. All of them need a device connected to Internet. Questions are done by the teacher. They could be: multiple choice questions, true or false questions or short answers.

As soon as students answer the questions, the teacher can discover the correct answers, obtaining an instant statistic about the success achieved by the class.

Once the activity is finished, the results are reflected in a report that shows the individual answers provided by each student, as well as the overall statistics obtained.

Socrative (http://www.socrative.com/) is a free application. It provides a platform for the student and another platform for the teacher.

The teacher has an identifier by each class and starts the questionnaire. The student connects to the application from the classroom identifier. Depending on the modality, the student receives feedback on whether or not their answers are correct and why. Finally the teacher can collect the individual answers in excel or pdf format for an after detailed analysis. The application also allows generating the questionnaire in pdf format.

We present the set of activities carried out with *Socrative* in one subject of the third course of Architectural Technology Degree. The new experience is considered as a playful activity. We try to unlink their realization to the formalism of obtaining a numerical note. This is a personal self-assessment, so it has no importance in the final score of the subject. This decision is founded with the intention of avoiding the stress that produces activities with numerical value that would avoid the pleasant learning that is pursued.

The methodology carried out is the following: lecture classes are still performed, they are considered necessary as a first step of knowledge. After every lesson is finished, the teacher invites the students to take the test with the *Socrative* application in the next class (so they can have a personal learning time before).

The test of the finished topic is performed at the next session. Generally the test is about 30 questions equally distributed by every question modality. The student has his application *Socrative Student Version* installed on his mobile device (phone, tablet or PC) and he joins the virtual class with a code facilitated by the teacher.

He identifies himself with his name and the test starts. There is the possibility to show the random questions for each student, as well as, random the answers in the multiple choice questions. Another advantage is to know after the question, whether it has been successful or not and what would have been the correct answer.

The professor, who is logged on the app *Socrative Teacher Version*, can see the results in real time. After the complete resolution of the test, a round of discussion and participation must be opened. The teacher can re-explain correct solutions that have been answered incorrectly in a massive way and re-emphasize issues that have not been clear in the lectures, Fig. 8.

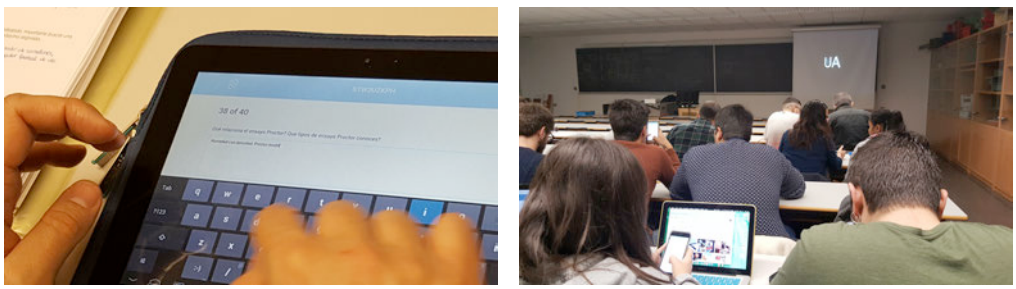

Fig. 8. App Socrative.com. Students of third year of Architectural Technology Degree during a Socrative test.

4 CONCLUSIONS

The course of *Computer and Informational skills CI2-Intermediate Level,* taught by the BUA, for the students of the subject of “Construction Equipment, Installation and Auxiliary resources” of the third year of the Architectural Technology Degree , is a continuation of the course that they carried out in the first year in the subject “Fundamentals of Construction”. The course is useful to the students because after they have acquired the basic knowledge, they are able to search the new contents they need. Now, they can choose the information they need and do not pay attention when they consider that the information is not important, and this is possible making appropriate use of ICTs.

In the practical part of the subject the student will put into practice his ability to understand and synthesize the information he has. We must highlight that during process of change, both, the teacher

and the student, must show interest in the specific knowledge that is being taught. The new working methods should help to understand aspects that have not been understood, to fix concepts and ideas and to improve the academic performance of the subject.

The app selected as ARS motivates the students by enhancing participation, debate and decision making. It is considered as an incentive of the academic performance. This new methodology, more constructive and practical, is based on a model of learning where the teacher must lose the protagonism.

Feedback is achieved between the student and the teacher. The teacher has the responsibility to teach the general and specific skills presented in the Educational Guide of the subject, but now an environment is created in which the student participates through the use of *Socrative app*.

With the development, exhibition and presentation of a poster, the student shows his creative part, always under a certain bases and pre-established criteria. This method of work is very useful for their future professional life in order to take part in a multidisciplinary team and submit to architectural and or constructive competitions.

On the other hand, these activities let measure the volume of non-face-to-face work that it had not been considered before in the final evaluation. The new teaching approach requires that the student not to leave continuous assessment during the semester.

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